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10/797,202

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EXAMINER

LINDSAY JR, WALTER LEE

ART UNIT

PAPER NUMBER

2812

DATE MAILED: 05/20/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

E/C

| | | | |
|------------------------------|---|------------------------------------|--|
| Office Action Summary | Application No. 10/797,202 | Applicant(s) JANKE, PAUL | |
| | Examiner Walter L. Lindsay, Jr. | Art Unit 2812 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-32 is/are pending in the application.
4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 12-23 is/are allowed.
- 6) ☒ Claim(s) 1-8, 10, 11 and 24-30 is/are rejected.
- 7) ☒ Claim(s) 9, 31 and 32 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. ____. |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>8/13/2004</u> . | 6) <input type="checkbox"/> Other: ____. |

DETAILED ACTION

This Office Action is in response to an Application filed 3/9/2004.

Currently, claims 1-32 are pending.

Specification

1. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.
2. It is noted that on page 8 that a word was corrected in ink. This change should be made in the body of the text in a reply to this Office Action.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.
4. Claims 27 and 28 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.
5. Claim 27 recites the limitation "two electron sensitive resist layers nearest the substrate" in lines 1 and 2. There is insufficient antecedent basis for this limitation in the claim.

The examiner will examine this claim in light of the text of the independent claim.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-5, 8, 10-11 and 24-28 are rejected under 35 U.S.C. 102(b) as being anticipated by Lai et al. (U.S. Patent No. 5,766,967 dated 6/16/1998).

Lai show the method as claimed in Figs. 3A.-3F and corresponding text as: providing a substrate (52); depositing at least a first (54), a second (56) and a third (58) electron sensitive resist layers (photoresist layers) over the substrate, the first electron sensitive resist layer being disposed closer to said substrate than are said second and third electron sensitive resist layers, the second electron sensitive resist layer being disposed closer to said substrate than is said third electron sensitive resist layer (col. 3, lines 35-56); forming a mold in at least the first, second and third electron sensitive resist layers (col. 3, lines 35-56); and evaporating the refractory metal (Ti/Pt/Au Titanium is a refractory metal that is include in this alloy) in the mold, wherein at least the first and third electron sensitive resist layers in the plurality of electron sensitive resist layers maintain their shape during the step of evaporating the refractory metal in the mold (col. 4, lines 33-44) (claim 1). Lai teaches that the forming of mold includes exposing the first, second and third electron sensitive resist layers to an electron beam, thereby defining exposed regions in the first second and third electron sensitive resist layers (col. 3, lines 35-56) (claim 2). Lai teaches developing the exposed regions in the first, second and third electron sensitive resist layers, thereby removing the exposed regions from the first, second and third electron sensitive resist layers and thereby creating the mold (col. 3, lines 35-56) (claim 3). Lai teaches that the first and third

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electron sensitive resist layers are less sensitive to the electron beam than is the second electron sensitive resist layer (col. 3, line 57- col. 4, line 24) (claim 4). Lai teaches that the middle electron sensitive layer has a viscosity that allows the second electron sensitive resist layer to be at least 7000Å thick (Corresponds to electrode size) (col. 4, lines 33-44) (claim 5). Lai teaches that the electrode is a gate electrode (col. 4, lines 45-47) (claim 8). Lai teaches that the mold defines a mushroom shape (col. 3, lines 35-56) (claim 10). Lai teaches the step of lifting off the plurality of electron sensitive resist layers after the step of depositing the gate contact (col. 4, lines 33-44) (claim 11). Lai show the method as claimed in Figs. 3A-3F and corresponding text as: providing a substrate (52); depositing a plurality of electron sensitive resist layers on the substrate, the plurality of electron sensitive resist layers comprising an electron sensitive resist layer nearest the substrate (54), an electron sensitive resist layer farthest from the substrate (58), and an intermediate electron sensitive resist layer formed between the electron sensitive resist layer nearest the substrate and the electron sensitive resist layer farthest from the substrate (56); forming a mold in at least the intermediate electron sensitive resist layer and in at least the electron sensitive resist layer nearest the substrate, the mold defining a mushroom shape (col. 3, lines 35-56); and evaporating the refractory metal in the mold, wherein the electron sensitive resist layer nearest the substrate and the electron sensitive resist layer farthest from the substrate maintain there shape during the evaporation of the refractory metal (col. 4, lines 33-44)(claim 24). Lai teaches the formation of the mold includes exposing the plurality of electron sensitive resist layers to an electron beam, thereby defining

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exposed regions in the plurality of electron sensitive resist layers (col. 3, lines 35-56) (claim 25). Lai teaches developing the exposed regions in the plurality of electron sensitive resist layers, thereby removing the exposed regions from the plurality of electron sensitive resist layers and thereby creating the mold (col. 3, lines 35-56) (claim 26). Lai teaches that the electron sensitive resist layer in the two electron sensitive resist layers nearest the substrate is less sensitive to the electron beam than the intermediate electron sensitive resist layer (col. 3, line 57-col. 4, line 24) (claim 27). Lai teaches that the intermediate electron sensitive resist layer has a viscosity which allows the intermediate electron sensitive resist layer to be at least 7000Å thick (col. 4, lines 33-44) (claim 28).

Claim Rejections - 35 USC § 103

8. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

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10. Claims 6-7 and 29-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lai et al. (U.S. Patent No. 5,766,967 dated 6/16/1998) in view of Minter et al. (U.S. Patent No. 6,255,035 dated 7/3/2001).

Lai shows the method substantially as claimed and described in the preceding paragraphs.

Lai lacks the anticipation only in not explicitly teaching that: 1) the refractory metal is selected from a member of the group consisting of tungsten and molybdenum (claims 6 and 29); and 2) the plurality of electron sensitive resist layers are exposed to temperatures up to approximately 180°C during the evaporation of the refractory metal (claims 7 and 30).

Minter shows a method of forming a metal T-Gates for high-speed semiconductor devices. In the formation of the T-gate (mushroom shape) metal contact, on suitable metal is tungsten is done by evaporation (col. 10, lines 1-24). A photoresist is also exposed to a temperature of approximately 180°C (col. 10, lines 27-33). The gate structure provides a solution for the problems that arise during processing by maintaining control of photoresist image shapes while maximizing yield (col. 3, line 56-col. 4, line 6).

It would be obvious to one of ordinary skill in the art, at the time the invention was made, to modify the method of Lai, by selecting a refractory metal from the group of tungsten and molybdenum and exposing the electron sensitive resist layers to temperatures up to approximately 180°C, as taught by Minter, with the motivation that

Minter teaches a solution for the problems that arise during processing by maintaining control of photoresist image shapes while maximizing yield.

Allowable Subject Matter

11. Claims 9, 31 and 32 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

12. Claims 12-23 are allowed.

13. The following is a statement of reasons for the indication of allowable subject matter: the prior art, either singly or in combination fails to anticipate or render obvious, the limitations of:

...further comprising depositing a high electrical conductivity metal gate contact over the refractory metal, thereby forming the gate electrode, as required by claim 9, as it depends from claim 1;

...further comprising depositing a gate contact over refractory metal, thereby forming a gate, as required by claim 31, as it depends from claim 24; and

...depositing a first, a second and a third electron sensitive resist layer over the substrate and the alignment markers;

removing the portions of the plurality of electron sensitive resist layers above and around the alignment markers;

forming a mold in plurality of electron sensitive resist layers using the alignment markers as reference points; and

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evaporating the refractory metal in the mold, the first and third electron sensitive resist maintaining their respective shapes during evaporation of the refractory metal, as is required by claim 12.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Walter L. Lindsay, Jr. whose telephone number is (571) 272-1674. The examiner can normally be reached on Monday-Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael S. Lebentritt can be reached on (571) 272-1873. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Walter L. Lindsay, Jr.
Examiner
Art Unit 2812

WLL

May 2, 2005

